

MS in Microelectronics and Semiconductor Engineering

NTU is not accepting applications in Microelectronics and Semiconductor Engineering at this time while the curriculum is under review.

The Microelectronics and Semiconductor Engineering program prepares students to work in the dynamic and continuously evolving field of semiconductor technology. Semiconductor engineers are at the very heart of the process that has affected all aspects of modern technology for the last half century. They develop the materials used to manufacture devices and design circuits that are ever more complex, and they are responsible for device manufacturing, as well as testing.

The program requires 33 semester credits of graduate work, consisting of core courses, specialization courses, and electives. The curriculum features substantial choice of specialization and elective courses, thereby enabling students to tailor the program to meet their specific needs and fulfill their particular aspirations.

Completion of the curriculum requires approximately one-and-a-half years of full-time graduate study. Students enrolled through NTU whose work schedules preclude full-time study should expect to fulfill the requirements in no more than five years by registering for at least two three-credit courses each academic year.

Admissions Requirements

NTU is currently not accepting applications to this program. The following information is intended for students admitted prior to November 2004.

Students must meet the following eligibility requirements for regular admission into the Microelectronics and Semiconductor Engineering program:

- BS degree in electrical engineering, chemical engineering, or materials science and engineering from an ABET-accredited engineering program in the United States or a CEAB-accredited program in Canada; or the equivalent from a foreign institution.
- Cumulative undergraduate G.P.A. of at least 2.9 on a 4.0 scale.

Students who do not meet these requirements may be granted provisional admission into the program, depending on academic background and experience. For additional information about provisional admission status, see the Admission section of this bulletin.

Curriculum Overview

A total of 33 credits is required for graduation. These credits should satisfy the following distribution requirement:

Core Curriculum (9 credits)

The core curriculum consists of three courses and enables students to develop knowledge in topics basic to the area of semiconductors and microelectronics.

Each student should complete the core courses prior to pursuing specialization and elective courses.

Specializations (18 credits)

Each student selects at least six courses from an area of specialization that represents the technical emphasis most compatible with the student's educational or career goals. Areas of specialization include integrated circuits, packaging, processing and fabrication, and semiconductor and device physics; other areas may also be available. Please consult an advisor or visit the NTU Web site for information about current specialization areas and courses available in those areas.

Electives (6 credits)

Students select two additional courses from the NTU graduate catalog to meet the elective requirement and bring their total credits to a minimum of 30. Elective credits are designed to give students the opportunity to tailor the program to their individual and organizational goals and needs. Students are encouraged to consult with an NTU advisor to select appropriate elective courses.

Thesis Option

Most students are expected to pursue a non-thesis Master of Science degree program. However, when desirable and appropriate, as determined by the student in consultation with his or her academic NTU advisor, a thesis option, constituting a maximum of six credits, is available. For additional information about the thesis option and guidelines, see the Academic Information section of this bulletin.

Program of Study Plan

Admitted students should submit a Program of Study Plan (PSP) to NTU prior to completion of six semester credit hours. Failure to submit a PSP increases the possibility of students completing duplicate courses or courses that are not applicable to their degree programs. Although NTU cannot guarantee preferred course availability in any given term, the PSP documents do guide course selection from partner universities. It may be necessary for a student to revise an approved PSP when course availability does not comply with the student's needs. The PSP form should be submitted through the NTU Web site.

The following list of courses illustrates the choice of academic material available to students who want to obtain an MS in Microelectronics and Semiconductor Engineering. *Specific courses and course requirements may change. Updates will be posted on the NTU Web site.*

Core Courses (9 credits)

Students must take the following three courses to satisfy the core requirement:

IC 510	Introduction to Semiconductors
IC 520	Integrated Circuit Devices
IC 730	Advanced Microelectronic Processing

Specialization Courses (18 credits)

Students select six courses from one specialization to satisfy this requirement. A choice of courses for several specializations is listed below. Please consult an advisor or visit the NTU Web site for information about other specializations and courses that may be available.

Integrated Circuits

IC 541	Introduction to Digital Integrated Circuits
IC 742	Advanced Digital Integrated Circuits
IC 520	Linear Integrated Circuits
IC 771	Advanced Analog Integrated Circuits
IC 752	Computer-Aided Engineering for Integrated Circuits
IC 776	Analysis and Design of VLSI-Analog-Digital Interface Integrated Circuits
DS 710	Digital Hardware Synthesis
DS 765	Digital System Design with Hardware Description Languages
DS 766	Digital System Design and Interfacing with Verilog
DS 770	Testing and Diagnosis of VLSI Systems
IC 534	Microelectronics Test Engineering

Packaging

IC 500	Design of Electronic Packaging
IC 503	Microelectronic Packaging Materials

IC 506	Microelectronic Reliability
IC 535	Microelectronics Failure Analysis
IC 701	Electronic Packaging Principles
IC 702	Electronic Packaging Design

Processing and Fabrication

EP 725	Materials Science and Processing of Semiconductor Devices
IC 506	Microelectronic Reliability
IC 535	Microelectronics Failure Analysis
IC 714	Semiconductor Material and Device Characterization
IC 792	Introduction to MEMS Design
MS 735	Defects in Materials
IC 730	Semiconductor Device Design and Analysis
IC 531	Microelectronics Test Engineering
IC 532	Vacuum Systems Engineering
IC 734	Plasma-Assisted Materials Processing
IC 736	Thin Film Physical Vapor Deposition
EP 724	Synthesis and Characterization of Electronic Materials
EP 741	Defects, Diffusion, and Ion Implantation in Semiconductors

Semiconductors and Device Physics

IC 714	Semiconductor Material and Device Characterization
IC 721	Semiconductor Device Theory I
IC 722	Semiconductor Device Theory II
IC 724	Solid-State Devices
IC 715	Solid-State Optics
IC 717	Semiconductor Lasers and LEDs
IC 727	Numerical Semiconductor Device Modeling

Elective Courses (6 credits)

Students may select their two elective courses from any of NTU's graduate-level courses, provided they have the appropriate prerequisite knowledge.